

KAPSABET HIGH SCHOOL

121/2 -

MATHS

- Paper 2



JULY
2022



Kenya Certificate of Secondary Education (K.C.S.E)
MATIMATHICS PAPER 2
2 HRS 30 MINS

Name Index Number

Class..... Candidates Signature.....

Date

2022 TRIAL 2 JULY INTERNAL EXAMINATION

(Kenya Certificate of Secondary Education)

Kenya Certificate of Secondary Education (K.C.S.E)

INSTRUCTIONS TO CANDIDATES

- Write your name and Admission number in the spaces provided at the top of this page.
- This paper consists of two sections: Section I and Section II.
- Answer **ALL** questions in section I and **ONLY FIVE** questions from Section II.
- All answers and workings must be written on the question paper in the spaces provided below each question.
- **Show** all the steps in your calculation, giving your answer at each stage in the spaces below each question.
- Non – Programmable silent electronic calculators and KNEC mathematical tables may e used, except where stated otherwise.

FOR EXAMINERS USE ONLY

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

SECTION II

17	18	19	20	21	22	23	24

**GRAND
TOTAL**

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SECTION I

1. If $a = 2.7^{\circ}\text{C}$, $b = 3.4^{\circ}\text{C}$, $c = 9.8^{\circ}\text{C}$ and $d = 3.0^{\circ}\text{C}$, find the percentage error in $bc-ad$. (4 mks)

2. Find the value of x in the equation $\log_{10}(2x-1) + \log_{10} 3 = \log_{10}(8x-1)$. (2 mks)

3. Find the compound interest on sh. 200,000 for 2 years at 14% pa. Compounded semi-annually. (3 mks)

4. Simplify by rationalising the denominator

$$\frac{\sqrt{2} + \sqrt{3}}{\sqrt{6} - \sqrt{3}}$$

(3 mks)

5. Express $\frac{30}{x-2} - \frac{30}{x} = \frac{1}{2}$ in the form $ax^2 + bx + c = 0$ hence solve the equation using the completing square method.

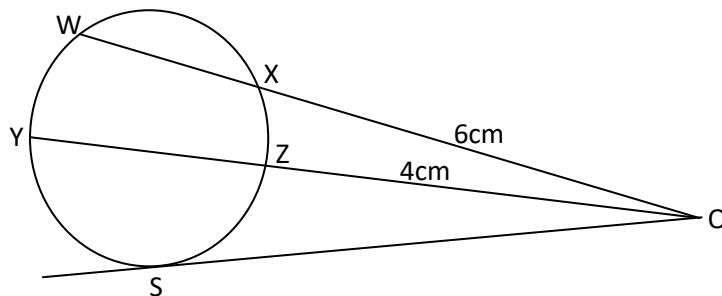
(4 mks)

6. The ratio of 12th to 10th term in a geometric series is 9:1. Find the common ratio. (2 mks)

7. i) Expand $(2 - \frac{1}{4}x)^5$ (1 mk)

ii) Use your expansion to find the value of $(1.96)^5$ correct to 3 decimal places. (2 mks)

8. Chord WX and YZ intersect externally at Q. The secant WQ = 11cm and QX = 6cm while ZQ = 4cm.



a) Calculate the length of chord YZ. (2 marks)

b) Using the answer in (a) above, find the length of the tangent SQ. (2 marks)

9. Given that $\begin{bmatrix} y - 1 & y + 1 \\ 3y & y \end{bmatrix}$ is a singular matrix, find the possible values of y . (3mks)

10. Given that $S = \frac{a(1 - r^n)}{1 - r}$, make n the subject of the formula. (3 marks)

11. It would take 18 men 12 days to dig a piece of land, if they work for 8 hours a day. How long will it take 24 men if they work 12 hours a day to cultivate three quarters of the same land. (3 marks)

12. Use logarithms to evaluate. (4 marks)

$$\sqrt[4]{\frac{0.8465 \times 12.14}{214.5 \div 9.067}}$$

13. The masses to the nearest kg of 50 adults were recorded as follows:

<u>Mass (kg)</u>	<u>Frequency (f)</u>
45 – 50	2
51 – 56	10
57 – 62	11
63 – 68	20
69 – 74	6
75 – 80	1

Calculate the quartile deviation.

(3 marks)

14. P varies as the cube of Q and inversely as the square root of R. If Q is increased by 20% and R decreased by 36%, find the percentage change in P. (3 marks)

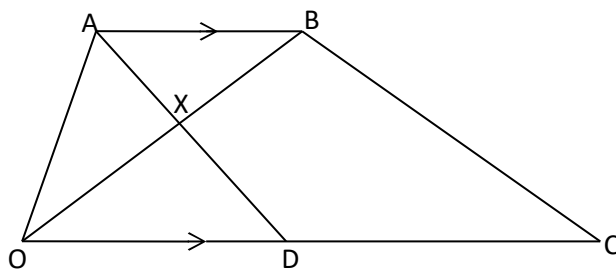
15. Solve $8 \cos^2 x - 2 \cos x - 1 = 0$

(3 marks)

16. $A(0,3)$, $B(1,5)$ and $C(4,11)$ are three points. Show that they are collinear. (3 marks)

SECTION II

17. In the figure below, $OABC$ is a trapezium. AB is parallel to OC and $OC = 5AB$. D is a point on OC such that $OD:DC = 3:2$



a) Given that $OA = p$ and $AB = Q$, express in terms of p and q .

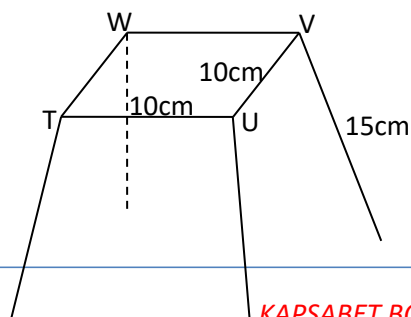
i) OB (1 mk)

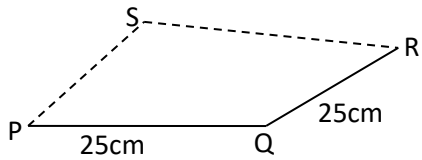
ii) AD (2 mks)

iii) CB (2 mks)

b) Lines OB and AD intersect at point X such that $AX = kAD$ and $OX = rOB$ where k and r are scalars. Determine the values of k and r . (5 marks)

18. The diagram below shows a lampshade in the shape of an open frustrum of an open square based right pyramid. The base $PQRS$ is a square of side 25cm . The top $TUVW$ is a square of side 10cm and each of the slanting edges of the frustrum is 15cm .





Calculate to **one decimal place**.

(a) The height of the frustrum.

(3 marks)

(b) The angle between

i) Line VR and the base.

(2 marks)

ii) Plane UQRV and the base.

(2 marks)

c) The volume of the frustrum.

(3 marks)

19. The table below shows the rates of taxation in a certain year.

<u>Income in K£ pa</u>	<u>Rate in Ksh per K£</u>
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1 – 3900	2
3901 – 7800	3
7801 – 11700	4
11701 – 15600	5
15601 – 19500	7
Above 19500	9

In that period, Juma was earning a basic salary of sh. 21,000 per month. In addition, he was entitled to a house allowance of sh. 9000 p.m. and a personal relief of ksh.105 p.m. He also has an insurance scheme for which he pays a monthly premium of sh. 2000. He is entitled to a relief on premium at 15% of the premium paid.

a) Calculate how much income tax Juma paid per month. (7 marks)

b) Juma's other deductions per month were cooperative society contributions of sh. 2000 and a loan repayment of sh. 2500. Calculate his net salary per month. (3 mks)

20. Wainaina has two dairy farm A and B. Farm A produces milk with $3\frac{1}{2}$ percent fat and farm B produces milk with $4\frac{3}{4}$ percent fat. Determine;

i) The total mass of milk fat in 50kg of milk from farm A and 30kg from farm B. (3 marks)

ii) The percentage of fat in a mixture of 50kg of milk from A and 30kg of milk from farm B. (2 marks)

iii) Determine the range of values of mass of milk from farm B that must be used in a 50kg mixture so that the mixture may have at least 4 percent fat. (5 marks)

21. A cupboard has 7 white cups and 5 brown ones all identical in size and shape. There was a blackout in the town and Mrs. Kamau had to select three cups, one after the other without replacing the previous one.

a) Draw a tree diagram for the information. (2 marks)

b) Calculate the probability that she chooses.

i) Two white cups and one brown cup. (2 marks)

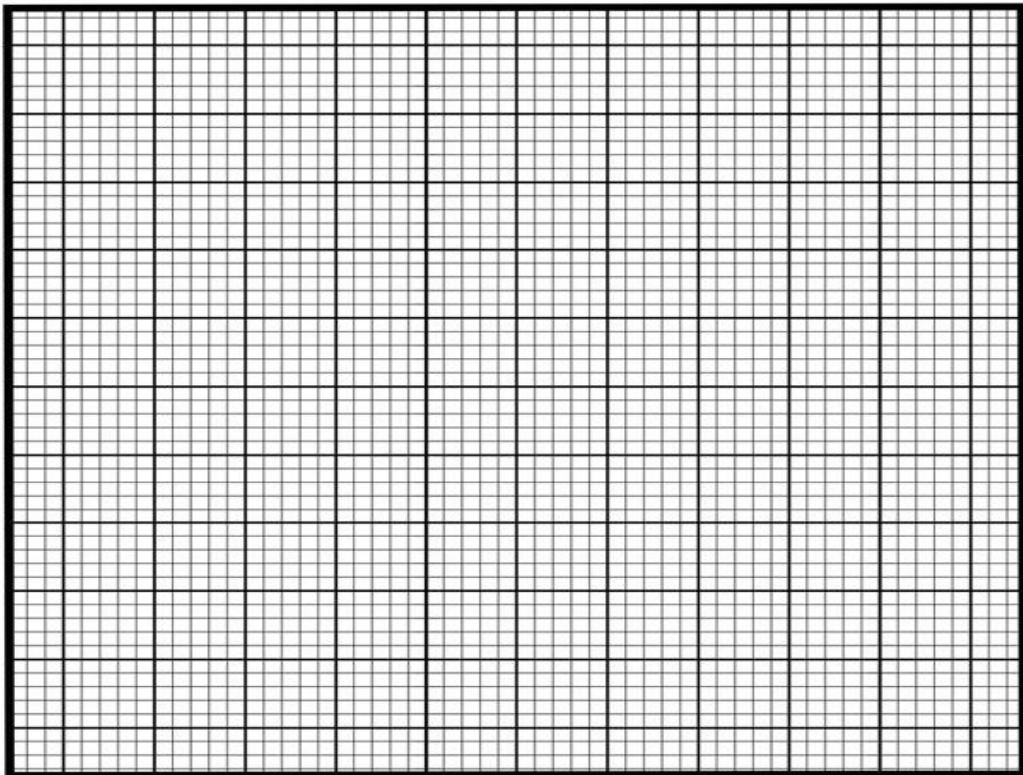
ii) Two brown cups and one white cup. (2 marks)

iii) At least one white cup. (2 marks)

- iv) Three cups of the same colour. (2 marks)

22. A triangle ABC has vertices $A(-5,-2)$, $B(-3,-2)$ and $C(-5,-5)$. The triangle is rotated through a positive quarter turn about the origin to obtain the image $A^1B^1C^1$.

- a) Draw triangle ABC and its image $A^1B^1C^1$ on the grid. (2 marks)



- b) $\triangle A^1B^1C^1$ is then reflected on the line $y + x = 0$ to get $\triangle A^{11}B^{11}C^{11}$ on the same grid. (2 marks)

- c) Find a single matrix of transformation that maps $\triangle ABC$ onto $\triangle A^{11}B^{11}C^{11}$. (3mks)

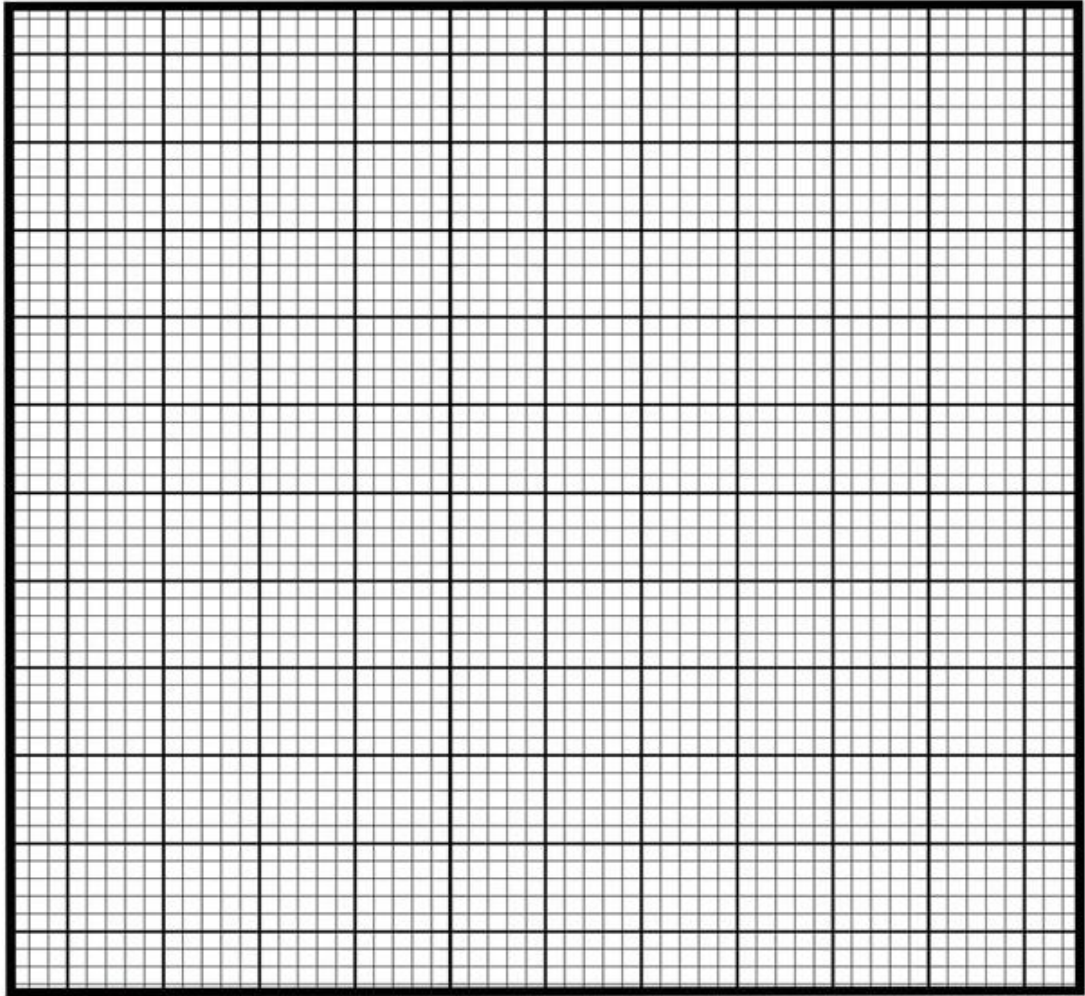
d) Describe the transformation in (c) above. (2 marks)

e) Find the coordinates on the image of $\triangle ABC$ under a shear factor 2 parallel to x-axis. (2 marks)

23. a) Complete the table below, giving the values correct to 1 decimal place. (2 marks)

x	0	40	80	120	160	200	240
$2\sin(x+20^\circ)$	0.7		2.0		0.0		-2.0
$\sqrt{3} \cos x$	1.7	1.3		-0.9		-1.6	

b) On the grid provided, draw the graphs of $y = 2\sin(x+20)^\circ$ and $y = \sqrt{3} \cos x$ for $0 \leq x \leq 240^\circ$ (5 marks)



- c) Use the graphs drawn in (b) above to determine:
- i) The values of x for which $2 \sin (x+20)^{\circ} = \sqrt{3} \cos x$. (2 marks)
 - ii) The difference in amplitude of $y = 2 \sin (x+20)^{\circ}$ and $y = \sqrt{3} \cos x$. (1 marks)

24. An aircraft leaves town P (30°S , 14°W) and moves directly east of town Q at a speed of 270 knots for 12 hours. Determine:
- a) i) the distance covered in nautical miles. (2 marks)

ii) the distance covered in km. (2 marks)

b) the position of town Q. (3 marks)

c) the local time at Q if the local time at P is 9.13p.m. Give your answer to the nearest minutes. (3 marks)